

WHAT IS CLAIMED IS:

1. An exposure apparatus, comprising:
a light source for producing an exposure beam;
5 an optical system having a closed space, for projecting the exposure beam to a substrate for exposure thereof;
first supplying means for supplying an inert gas into the closed space of said optical system; and
10 second supplying means for supplying one of oxygen and a clean air, so that the inert gas and oxygen can be supplied to the closed space.
2. An apparatus according to Claim 1, wherein
15 said optical system comprises one of an illumination optical system and a projection optical system.
3. An apparatus according to Claim 1, wherein
said light source comprises one of a light source for
20 producing ultraviolet rays and a light source for producing X-rays.
4. An apparatus according to Claim 3, wherein
said light source comprises an ArF excimer laser light
25 source.
5. An apparatus according to Claim 1, wherein

the inert gas comprises one of a nitrogen gas, a helium gas, and a neon gas.

5 6. An apparatus according to Claim 1, further comprising means for mixing one of oxygen and a clean air into the inert gas.

10 7. An apparatus according to Claim 6, further comprising a supplying line for supplying the inert gas into the closed space, wherein the oxygen or clean air is introduced from a line branched from the supplying line, for mixture of the same into the inert gas.

15 8. An apparatus according to Claim 1, further comprising means for discharging the gas inside the closed space outwardly.

20 9. An apparatus according to Claim 8, further comprising means for transforming ozone remaining in the discharged gas into oxygen for reuse thereof.

25 10. An apparatus according to Claim 1, further comprising means for changing the wavelength of the exposure beam.

11. An apparatus according to Claim 10, wherein,

when the oxygen is supplied, the wavelength of exposure beam is changed into a wavelength region higher than an oxygen absorptivity.

- 5 12. An apparatus according to Claim 10, wherein, when the oxygen is supplied, the wavelength of exposure beam is changed to a shorter wavelength.

- 10 13. A device manufacturing method comprising the steps of:
 preparing an exposure apparatus as recited in Claim 1; and
 performing an exposure process by use of the exposure apparatus.

- 15 14. A method according to Claim 13, further comprising applying a resist to a substrate, before the exposure process, and developing the substrate after the exposure process.

- 20 15. A method of cleaning an optical element of an exposure apparatus for exposing a substrate with an exposure beam of ultraviolet rays or X-rays, projected thereto, said method comprising the steps of:

- 25 supplying an inert gas containing a small amount of oxygen into a space in which the optical element is placed;

projecting the exposure beam so that ozone is produced in the space; and

removing an organic compound deposited on the optical element through photochemical reaction by
5 projection of the exposure beam and the produced ozone.

16. A method according to Claim 15, further comprising changing a wavelength of the exposure beam,
10 between exposure of the substrate and the cleaning of the optical element.

17. A method according to Claim 16, wherein the wavelength of exposure beam is changed by one of
15 controlling actuation of a light source for producing the exposure beam and inserting wavelength changing means to a light path.

18. A method according to Claim 15, further
20 comprising discharging the removed organic compound outwardly of the space.